Kurt Semm and the Fight against Skepticism: Endoscopic Hemostasis, Laparoscopic Appendectomy, and Semm's Impact on the "Laparoscopic Revolution"

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ABSTRACT

In the 1970s, Semm developed thermocoagulation, adapted the Roeder Loop, and further invented extra- and intracorporeal endoscopic knotting to achieve endoscopic hemostasis. His numerous technical inventions, especially the electronic insufflator, allowed more complex operations to be performed laparoscopically. His technique, however, was not quickly adopted by the surgical community. When the first fully laparoscopic appendectomy was carried out by Semm in 1980, a veritable storm broke loose. In the opinion of many prominent surgeons, Semm exaggerated the problem of adhesions, and laparoscopic technique itself was regarded as very dangerous. Misunderstood by medical scientists, Semm displayed an ability to force his ideas through despite skepticism and suspicion. He realized that endoscopic surgery had tremendous potential, and promoted laparoscopic technique not only in his field of gynecology but among general surgeons as well. In 1985, Muhe, of Boblingen, Germany, used Semm's technique to remove the first gallbladder in the world laparoscopically. Three years later when Semm presented a videotape of his laparoscopic appendectomy in Baltimore, he gave impetus to McKernan and Saye of Marietta, Georgia, to carry out the first laparoscopic cholecystectomy in the United States.

ENDOSCOPIC HEMOSTASIS

In the early 1970s, Semm became a dynamic proponent of thermocoagulation. He published several articles (in German and English) and devoted much space in his 1976 book "Pelviskopie und Hysteroskopie" to a discussion of the thermocoagulation technique. There he concluded that the use of high frequency current developed for major surgery "is not free of incalculable risk for gynecological endoscopy."[1] In his opinion, "high frequency current was introduced into endoscopy in an almost thoughtless way with no consideration of physics and technology."[2]

The invention of thermocoagulation, even though it did not find wide acceptance among gynecologists, was Semm's first step to finding a solution for controlling intraoperative bleeding. Semm did not limit his research on hemostasis to thermocoagulation, but forged ahead into other areas. A crucial innovation in laparoscopic surgery was his development of intra- and extracorporeal knots **(Figure 1)**.

Loop Ligator

In February 1994, Semm recalled the early days of Roeder Loop application in endoscopic surgery:

> I had a patient from Persia. She had come to have a sterilization done and had a visa for only three days. Fate would have it that she got a net-bleeeding and normally a laparotomy would be necessary to get the bleeding under control. I thought that maybe the Roeder Loop, that we have used for years during Wertheim hysterectomies, could be the solution. But I had no instrument to get the dumb loop into the abdomen. So I improvised, and it worked! It was 1975 or 1976. By 1977 in our clinic the loop ligature had become routine in adnexectomy.[3]

Semm announced the invention of his loop-applicator in several publications, both in German and English.[4] One can not help but note that the ability to introduce the Roeder Loop into a normal 5 mm trocar gave him a feeling of self-confidence: "After the loop became routine, I thought to myself that I could do everything in a different way."[5]

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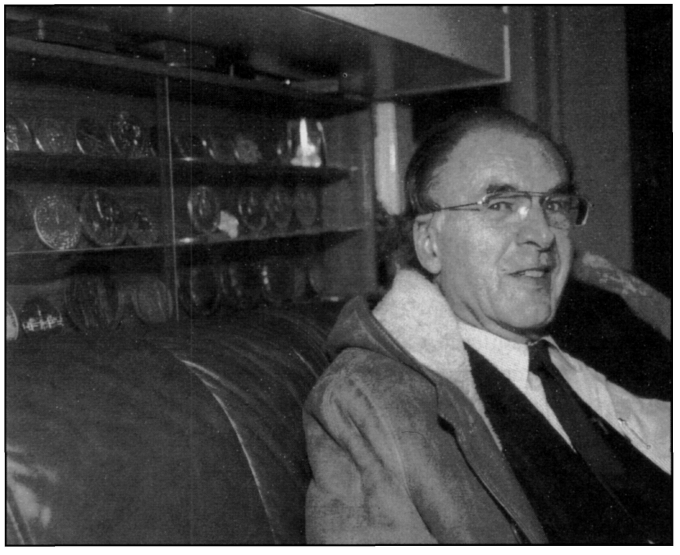

Figure 1. Kurt Semm in his office at the University of Kiel, February 1994. (Figure C-4 in *Highlights in the History of Laparoscopy.*)

Laparoscopic Suturing

The idea of performing laparoscopic suturing became an obsession. Semm thought about it all the time. How could suturing be performed inside the abdominal cavity? One day, on a plane en route from the United States to Germany, Semm came to the conclusion that fashioning a knot outside the abdominal cavity and then transferring the knot inside the abdomen could be a solution. As the plane reached Frankfurt am Main Airport, Semm already had the concept of the new technique. Soon, extracorporeal knotting was introduced into the Women's University Clinic in Kiel. "From there it went step by step: the intracorporeal knot, the microsuture. And everybody said, "He's gone absolutely crazy," remarked Semm.[6]

Further Technical Developments. "A New Era of Gynecologic Surgery"

Semm was an amazingly fruitful inventor, an endless source of new ideas. His endocoagulator (using a 12 V energy source) achieved coagulation hemostasis at 100 degrees Celsius. The aquapurator alternated insufflation and aspiration of physiologic saline solution. In Semm's opinion, this lavage was instrumental in the prevention of postoperative adhesions. Another key invention was the electronic insufflator, which measures, electronically and continuously, intra-abdominal pressure and replaces lost carbon dioxide, enabling repeated instrument changes **(Figure 2)**. The electronic insufflator allowed more complex operations to be performed by making the technical side of the operation similar to conditions which exist under general surgery. In 1979, Semm announced that the new technical equipment had opened up "a new era of gynecologic surgery."[7]

Semm found an effective way to bring his inventions into practice. Semm's brother and father, owners of the medical instrument company, WISAP, produced instruments for him almost overnight.[8] It gave Semm a period of only weeks between design of a device and its introduction into clinical use, while others waited years for their ideas to be realized. This made Semm a lot of enemies.

Semm's numerous innovations in the field of laparoscopy significantly expanded the spectrum of operative possibilities. Already in the late 1970s his list of laparoscopic procedures included myomectomy, ovariectomy, ovarian cysts resection, adnexectomy, treatment of tubal pregnancy, and many others.[9] The sky-rocketing numbers of operations performed by Semm astonished everyone. Many received the reports with disbelief, maintaining that such feats were impossible. Some theorized that he only began his operations laparoscopically but completed them conventionally. Those, however, who witnessed him in action spoke of "the magician of Kiel," and "the chairman of the Magic Club."[10] A feeling for Semm's impact can be gained from a comment on Semm's technique by an astonished observer who asked in the February 1, 1980 issue of "Medical

Figure 2. Semm's electronic insufflator. (Figure C-4 in *Highlights in the History of Laparoscopy.*)

Figure 3. A gynecologist teaching surgeons. . . . Left to right: Semm, Buess, and Gotz. (Figure C-6 in *Highlights in the History of Laparoscopy.*)

Tribune": "When will the first appendix or gallbladder disappear into an endoscope?"[11] The first half of this question did not wait long for an answer. On September 13 of the same year, Semm performed the first fully laparoscopic appendectomy.[12]

LAPAROSCOPIC APPENDECTOMY

In the 1980s, the gap between surgeons and gynecologists was immense. Many surgeons believed that gynecologists had "operation envy," that "real" operations were exclusively the domain of surgery, not gynecology. To a practitioner of another specialty, operations such as appendectomy must remain forever unattainable. Gynecologists were thought to suffer from inferiority complexes. Semm's entrance into general surgery was seen, then, as the attempt of an over-ambitious gynecologist to bolster his "operation ego." Surgeons, hypersensitive to a shrinking of their field, could not appreciate the fact that Semm had actually offered them a chance to regain some of their prestige.

Surgeons' Criticism

Semm describes the reaction of the medical world to the announcement of laparoscopic appendectomy as the "worst criticism" he had received in his career. "Both surgeons and gynecologists were angry with me, they were throwing stones at me. All my initial attempts to publish on laparoscopic appendectomy were refused, with the comment that such nonsense does not and will never belong to general surgery," he complained.[13] Surgeons saw no reason to change a well-established working method into a complicated technical matter. Their unfamiliarity with laparoscopic technique left them unprepared for "culture shock," for a complete reworking of surgical concepts.[14] Additionally, surgeons had an aversion to granting outsiders competency in their field. A gynecologist teaching a surgeon how to perform an operation was simply unthinkable. That this is exactly what Semm did is evidenced by his publication "Operative Manual for Endoscopic Abdominal Surgery" (1984).[15] Semm had crossed a border, hitherto seen as impassable **(Figure 3)**.

Although detailed descriptions of laparoscopic appendectomy were not published until 1982 in the United States[16] and 1983 in Germany,[17] this in no way means that discussion of the topic did not occur in medical circles. Semm's operation caused a furor.[18] In March 1983, a journalist of "Medical Tribune" summarized the major criticisms aimed at Semm:

> Semm exaggerates the problem of adhesions only in order to find a justification for his key-hole surgery. . .Thanks to modern methods of anesthesia, laparotomy today no longer poses a problem. This is the only way for a surgeon to be able to view the entire abdomen and to direct his procedure accordingly. Postoperative adhesions can lead to complications, but they in no way occur with such frequency that one must switch to endoscopic operations, believes Prof. Bruecke. Many superfluous operations are being carried out even today. The danger in expanding the endoscopic appendectomy, which only seems to be easier and lessdangerous to perform than conventional methods, is that still more unnecessary appendectomies will be per-formed than have been to date. We thus face the following fundamental question: Do the advantages of endoscopic operations—avoidance of laparotomy, diminishing the pain of the incision, early mobilization, and avoidance of post-operative adhesions—outweigh the disadvantages—greater expenditure on technology and more complicated methods of operating?[19]

Semm's technique was generally considered too dangerous for the the patient. Many believed that he was going too far. Even laparoscopists thought Semm had exaggerated, that it was unnatural to try and make a surgical instrument out of a diagnostic tool. Michael Mintz, one of Palmer's close associates in Paris, confirms that numerous critics of Semm attacked him for publishing only the technical side of his technique without mentioning his patients or offer-

ing statistics to back up the clinical safety of laparoscopy and laparoscopic surgery.[20] When Semm did publish genuine statistical information concerning the clinical safety of the laparoscopic procedure, a true storm broke loose.

Gynecologists' Criticism

Frangenheim unofficially took upon himself the role of speaker for a group of physicians who were seriously concerned by Semm's activities. His criticism of Semm illustrates and dramatizes the widely diverging attitudes and approaches to laparoscopy which had formed in the late 1970s.

Frangenheim's opening remark in the 1979 issue of "Geburtshilfe und Frauenheilkunde" indicated that the discussion would be highly charged. "So we now have the published statistics on the situation of laparoscopy in Germany from Semm. What impressive numbers, and how little they tell us!" he scoffed.[21] He then attacked Semm's figures as "not neutral" and for their reference to specific manufacturers. Semm's thermocoagulation received a special measure of criticism. Frangenheim claimed that sterilization by thermocoagulation resulted in a higher pregnancy rate than high-frequency current sterilization. Laparoscopists "are moreover in the position to handle monopolar high-frequency current carefully," he maintained. "These operators refuse to tolerate such arrogant tutelage in what they should do and not do." Frangenheim also criticized Semm's enthusiasm for the "Roeder Loop," claiming that the device exceeded the scope of the routine laparoscopist. "The operation is only for 'artists,'" he wrote. For the patient, maintained Frangenheim, there was less risk in the use of laparotomy to diminish serious bleeding.

SEMM'S INFLUENCE ON MODERN SURGERY

In the last few decades, medical breakthroughs and inventions have been accomplished by highly specialized research teams, or even industrial concerns. Semm completely departed from this model, and in one person united physician, researcher, and technician. Being the director of a university clinic, he had a large range of possibilities at his disposal. He vigorously applied these resources to the advancement of laparoscopy. Misunderstood by medical scientists, he displayed an ability to force his ideas through despite skepticism and suspicion. Semm realized that endoscopic surgery had tremendous potential not only in the field of gynecology but in general surgery as well. He continued to promote laparoscopic surgery led by a vision of lessening trauma for the patient. In 1981, for example, he took a daring step and invited Hans Troidl (b. 1938), a professor of general surgery at the Kiel Surgical Clinic, to assist him during laparoscopic appendectomy.[22] When Semm presented his technique at a 1983 Endoscopy Congress in Erlangen, he convinced Bernd C. Manegold of Mannheim, a prominent German surgical endoscopist, that "Laparoscopic cholecystectomy and the bowel anastomosis under laparoscopic vision had moved into the domain of the possible."[23] Following Semm's lead, Friedrich Goetz and Arnold Pier, two German general surgeons, began conducting surgical laparoscopy on a large scale. By the early 1990s, they carried out hundreds of laparoscopic appendectomies and went on to perfect the technique even for acute appendicitis.[24]

Laparoscopic Cholecystectomy and "Laparoscopic Revolution"

In 1985, Erich Muhe (b. 1938), a professor of surgery in Boblingen, Germany, used Semm's instruments and technique to remove the first gallbladder in the world laparoscopically.[25] Three years later, when Semm presented a videotape of his laparoscopic appendectomy in Baltimore, he gave impetus to J. Barry McKernan (general surgeon) and William B. Saye (gynecologist) of Marietta, Georgia, to carry out the first laparoscopic cholecystectomy in the United States.[26]

Shortly thereafter the "laparoscopic revolution" broke out, and Semm's laparoscopic expertise was in great demand **(Figure 4)**. His publications on the subject, translated into many languages, were read across the world by thousands of surgeons. Without Semm's input, the development of a "Laparoscopic Revolution," while perhaps inevitable, would have been postponed by many years. Thanks to him medicine made a tremendous leap forward.[27]

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22. "It was a Sunday, I remember, because he [Semm] used to perform his innovative procedures on the weekend. I believe this took place in 1981, shortly before I left for Cologne in October of that year." To Troidl, the endoscopic appendectomy with Semm was "unforgettable experience." Troidl H. Interview by GS. Litynski, tape recording, October 11,1995. In Litynski GS. *Highlights in the History of Laparoscopy.* Frankfurt, Germany: B. Bernert Verlag; 1996

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26. After Semm's video presentation during a seminar in Baltimore (April 1988), McKernan and Saye approached the German gynecologists. "Since in those days endoscopic instruments were very short in our hospital, we decided to buy our own instruments at our own cost. Semm took us over and we (McKernan and Saye) wrote him a check." McKernan JB., interview by GS. Litynski, tape recording, March 20, 1996. In Litynski GS. *Highlights in the History of Laparoscopy.* Frankfurt, Germany: B. Bernert Verlag; 1996

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